Kennecott
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Robert A. Malone
Director, Environmental Affairs

Kennecott

September 10, 1985

Mr. Calvin Sudweeks, Director
Bureau of Water Pollution Control
State Division of Health
P. O. Box 45500
Salt Lake City, Utah 84145

SUBJECT: Utah Modernization Project
Response to Information Request

Dear Mr. Sudweeks:

Provided in the enclosed documents is information regarding the Utah Modernization Project, requested by Mr. Bryon Elwell of your staff. Also enclosed in this package is a drawing of typical drop box details (Drawing 410-SKC-106) requested by Mr. Steve McNeal of your staff.

Please contact Mr. Al Trbovich (322-8371) if you require additional information.

Very truly yours,

R. A. Malone

/mf
Enclosures

cc: L. K. Jacobsen, w/o enc.
A. M. Trbovich, w/o enc.

RESPONSES TO REQUESTS BY MR. BRYON ELWELL

1. Question - The design flow rate of 50 gallons per person per day appears to be high. From our past experience, a flow rate of 35 gallons per person per day may be more appropriate; however, if you have data that will substantiate the use of 50 gallons per person per day, then it will be accepted. The flow rate is very important in sizing your wastewater facility and assuring that sufficient organic loading is taking place. Any anticipated employee growth over the next 20 years should also be incorporated into the design.

   Response - The design flow rate has been reduced to 40 gallons per person per day. Present concentrator plant design anticipates a population of 240. Possible growth has been allowed by designing the treatment plant for 300 people. Oversizing the plant is not a concern because the plant is capable of normal operations at 25% capacity.

   The nominal plant capacity has been changed from our original submission to 14,000 GPD to reflect the new population and design flow data. The enclosed drawing 712-SKC-101 and the attached Table 5-7 also reflect the new criteria.

2. Question - More detailed drawings of the entire extended aeration treatment system are needed for our review. The drawings should include the following:

   a. Each process unit should be dimensioned so that proper sizing can be determined.

   b. The hydraulic grade profile of the system needs to be provided.

   c. All bypass lines should be shown on the plans.

   Response - The layout of the process units and the hydraulic grade profile is provided in Drawing 712-SKC-101. Additional information is provided in the enclosed Smith and Loveless engineering data sheets.

3. Question - What types of waste will enter the janitorial sinks? Will the wastes require pretreatment or can the system handle them without affecting the overall treatment?

   Response - Normal household and industrial cleaning agents and the resultant dirty water will enter the janitorial sinks. The system can handle these agents without a detrimental effect on overall treatment.

AMT1/e

4. Question - Laboratory facilities or a contract with a lab is necessary to monitor the plant's effluent.

   Response - Laboratory support will be provided by Kennecott's research technology laboratory. This facility is EPA certified.

5. Question - A flow measuring device to measure the influent flows into the plant is required.

   Response - A flow measuring device is planned for the influent flows, as specified on Drawing 712-SKC-101.

6. Question - Duplicate unit processes are required so that each unit of the plant can be removed from service independently.

   Response - Mechanical systems (i.e., blowers, sludge pumps) are in duplicate. Tanks are not in duplicate. A 20,000 gallon holding tank is provided for use when the treatment plant is off-line.

7. Question - Standby power should be provided to those units requiring power.

   Response - Separate feeders will be provided from separate power sources.

8. Question - Bar Screen:

   a. The approach channel should be shown along with its slope.

   b. The slope of the screen should be between 30° and 45° with the horizontal and should be shown on the plans along with the screen spacing.

   Response - This information is provided on Drawing 712-SKC-101.

9. Question - Dual Media Filter:

   a. The filtration rate needs to be specified.

   b. The media type, effective size, uniformity coefficient, specific gravity, and depth need to be specified.

   c. The backwash rate and duration should be given.

   d. The backwash recirculation rate to the headworks should be given.

   e. A backwash water supply storage unit having a minimum capacity of two backwash volumes is required.

   f. Pumps adequate to provide the required rate of backwashing are required.

Response - This information is provided in the enclosed Smith and Loveless engineering data sheets.

10. Question - Chlorine Tank:

    a. How will chlorine be fed into the wastewater?

    b. What chlorine dosage will be used?

    c. How will sludge accumulation be handled?

    Response - The chlorine contact tank will be equipped with a Sanuril chlorinator for chlorine addition. The Sanuril chlorinator contains chlorine tablets and uses a weir to control the water level in the chlorinator. The dosage is controlled so that the chlorine content will not be less than 1 part per million. Sludge accumulation is not a problem under normal operating conditions. If sludge accumulates, a portable pump will be used for removal.

11. Question - A more detailed design of sludge handling and disposal is needed for our review.

    Response - This information is provided in the enclosed Smith and Loveless engineering data sheets. Excess sludge will be applied as a soil conditioner on Kennecott property as part of our ongoing reclamation program or will be sold to local farmers as a soil conditioner.

12. Question - Design calculations for sizing of the aeration basin are needed for our review.

    Response - The calculations are attached.

13. Question - Plan and profile drawings of the sewer feeding the wastewater plant should be submitted for our review.

    Response - This information is provided on Drawing 712-SKC-101.

14. Question - Details of the typical manhole, sewer trench and holding tank should be submitted for our review.

    Response - This information is provided on Drawing 712-SKC-101.

15. Question - The location of the groundwater table and any culinary wells relative to the project site should be shown on the plans along with their depths.

    Response - Two culinary wells owned and operated by the Copperton Water Improvement District are located in Barney's Canyon, approximately

one-third mile northeast of the eastern tailings thickeners. These two wells are designated W-31 and W-32 in "Geologic, Ground and Surface Water Data Background and Progress Report of Kennecott's Utah Copper Division (UCD) Mine Hydrogeologic Study." When constructed, the depth to water in W-31 was 139 feet. The well is 1,274 feet deep and is perforated from 149 feet to 1,218 feet.

An abandoned and filled monitor well, K-81, is located on the southwest corner of the concentrator site. When drilled, the depth to water in this well was 127 feet. Additional information about the relevant wells may be found in the cited document, which is in the Bureau's possession.

Thirty-six bore holes up to approximately 100 feet deep were drilled at the concentrator site area as part of the site soil study. Except for a very small perched aquifer 35 feet below the tailings thickeners, no free groundwater was encountered

16. Question - What constitutes process water?

Response - Process water is water used in the comminution and flotation of copper-bearing ores. This water may be recycled through the concentrator plant or may be used in slurrying tailings to the tailings pond. Except as allowed under the existing Utah Copper Division NPDES Permit, tailings pond water is recycled back to the concentrator for reuse in the process.

17. Question - What is the storage capacity of the tailings pond?

Response - Under Part I, Section A, Clause 3 of Utah Copper Division's existing NPDES, a discharge exemption for precipitation snowmelt runoff is allowed if the tailings pond and associated clarification channel have a total pool volume of 380 acre-feet. Kennecott is diligent in maintaining this available volume.

The tailings pond is capable of receiving tailings at a normal operating rate for a minimum of 30 additional years.

AMT1/e

TABLE 5-7

Sanitary Wastewater Treatment

Design Criteria

Design Loading	Population - 300 Per Capita Production 40 gpd Influent BOD - 250 mg/l Influent SS - 250 mg/l
Bar Screen	Manually cleaned Influent flow 12000 gpd Bar spacing 1-1/2" center to center
Comminutors	Min velocity - 2 fps
Aeration Basin	Extended aeration Tank Volume - 14000 gals. Aeration Time - 24 hours minimum Tank Vol/lb influent BOD - 75 cf minimum Air supply per lb of BOD/day - 1500 cf minimum
Clarifier	Depth - 8 foot minimum
Chlorine Tank	Chlorine Contact Period - 30 minutes minimum
Filter	Dual media/two cell.
Final effluent quality	Average 30 day BOD less than 15 mg/l Average 7 day BOD less than 20 mg/l Average 30 day SS less than 10 mg/l Average 7 day SS less than 12 mg/l pH between 6.5 and 9.0 The geometric mean of total coliform and fecal coliform in effluent samples collected during any 30 day period will not exceed either 200 per 100 ml or 20 per 100 ml respectively, nor will the geometric mean exceed 250 per 100 ml or 25 per 100 ml respectively during any 7-day period.

CALCULATIONS

Peak Flow 13,000 GPD
$B.O.D._5$ 27.1 #/day

Aeration Tank Size:

Assume 15# B.O.D./1000 cu. ft.
1806 cu. ft. tank required
1806 cu. ft. x 7.5 gal/cu. ft. - 13,545 gallon tank

Use a 14,000 gallon tank

Blower Sizing:

2100 cu. ft. of air required/# $B.O.D._5$
2100 ÷ 1440 x 27.1 = 39.52 or 40 CFM required
40 SCFM x 1.22 (to correct to 5000' elevation)
Two 49 SCFM Blowers required for aeration
Return sludge air lift requires 12 SCFM

Plant requires two blowers, each at least 61 SCFM

Clarifier Overflow:

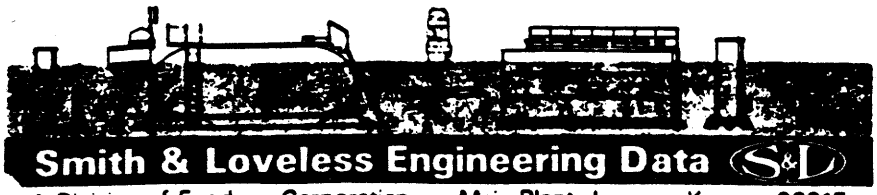
Assume 300 GPD/sq. ft. average flow
Assume 600 GPD/sq. ft. overflow rate
Assume 2000 GPH peak hour
Then clarifier must have 2000 GPH x 24 hours ÷ 600 GPD/sq
= 80 sq. ft. surface area.

Use a 10C97 Clarifier with 97 sq. ft. surface area.

Chlorine Contact Tank:

Assume 30 min detention at peak flow
Assume 2000 GPH at peak flow

Use a 1000 gallon tank.



Smith & Loveless Engineering Data S&L
A Division of Ecodyne Corporation • Main Plant: Lenexa, Kansas 66215

SPECIFICATIONS
MODEL V "ADDIGEST"
RECTANGULAR AERATION TANK MODEL

AERATION TANK

The aeration tank shall be rectangular in plan with arcuate sides and shall be framed with structural steel top and bottom. The arcuate side walls of the aeration tank shall be mitered at the corners and shall be field welded to special structural corner members provided by the manufacturer. The concrete foundation shall form the aeration tank bottom. The side walls shall be set in a keyway in the foundation and securely attached to the foundation by powder-actuated fasteners. The keyway shall be sealed to make the tank watertight. The tank shall have curved sides to insure that mixing roll takes place at maximum velocity with minimum energy required.

CONSTRUCTION

The walls shall be structural grade steel plate not less than 1/4" thick. All structural shapes used for reinforcing and bracing shall have 1/4" minimum thickness. All welded steel structural members shall be joined by electric arc welding with fillets of adequate section for the joint involved.

The aeration tank structure shall be designed to withstand the hydrostatic pressures encountered when the tank is installed above grade and filled to its normal operating water level, or the normal soil pressures encountered when installed below grade, backfilled and dewatered.

INLET PIPE

The inlet shall be as shown on the plans, Class 150 cast iron pipe to bridge the disturbed earth adjacent to the plant. The cast iron pipe shall be connected to the tank as shown on the plans.

OUTLET PIPE

The outlet pipe shall fit in a steel grout box. The pipe shall be grouted in the field to take care of any misalignment.

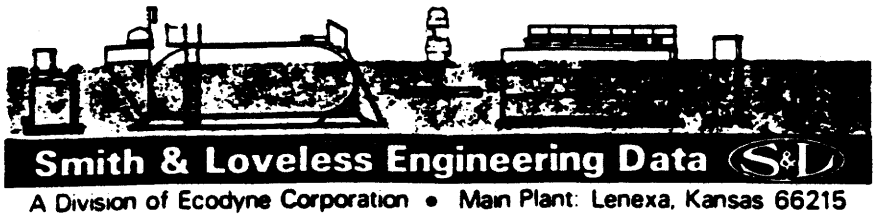
ACCESS LADDER AND WALKWAY

An aluminum ladder attached to the end of the walkway between the clarifier and aeration tanks shall be provided when the plant is installed with the top more than 36" above surrounding ground level. Walkway grating shall be of non-skid design and 1-1/2" pipe handrail with midrail shall be supplied for each side of the walkway.

Another aluminum ladder is to be attached to the inlet end when the plant is installed with the top more than 36" above surrounding ground level.

DIFFUSERS

A rectangular steel duct air supply header shall extend along the top of two sides of the aeration tank. Each one inch galvanized pipe diffuser shall extend from the supply header through a 1" ball valve. The ball valve shall be for individual throttling of the air flow.



Smith & Loveless Engineering Data S&L
A Division of Ecodyne Corporation • Main Plant: Lenexa, Kansas 66215

SPECIFICATIONS FOR SMITH & LOVELESS MODEL V "ADDIGEST" HOPPER BOTTOM CLARIFIER

CLARIFIER TANK

The clarifier shall be a welded steel structure, rectangular in plan section, and shall have one or more sludge hoppers.

CONSTRUCTION

Each unit shall form a complete clarifier. The tank walls shall be structural grade steel plate not less than 1/4" thick. All structural shapes used for reinforcing and bracing shall have 1/4" minimum thickness in the thinnest section. All welded steel structural members shall be joined by electric arc welding with fillets of adequate section for the joint involved. Where required for additional sectional strength or watertightness, such welds shall be continuous inside and out. Corrosion protected or corrosion resistant materials shall be used throughout.

The clarifier structure shall be designed to withstand the hydrostatic pressures encountered when the plant is installed above grade and filled to its normal operating level or the normal soil pressures encountered when installed below grade, backfilled and dewatered.

INLET PIPE AND DISTRIBUTION BOX

A schedule 40 inlet pipe extending from the outlet end of the aeration tank to a clarifier grout box shall be furnished as shown on the plans. The grout box shall be constructed to make access to the distribution trough. The distribution trough shall be sized to prevent solids settling. Flow to the clarifier shall be through equalizing orifices in the bottom of the trough. The trough shall permit the bulk of the floating material to surface in the trough. This shall be skimmed and returned to the aeration tank. This is done to reduce skimming and surface overflow rate in the clarifier.

SLUDGE REMOVAL SYSTEM

The sludge return from each clarifier hopper shall be by sludge ejector pump. The sludge pump shall have an infinitely variable pumping rate of 1 GPM to 40 GPM. The variable rate is necessary to assure the correct sludge to influent flow ratio. The sludge pump shall have an inlet short duration flow rate of 200 GPM to assure sweeping down the the solids from the sloping sides of the clarifier. Once each pumping cycle there shall be a reverse flow from the inlet pipe to dislodge solids on the sloping hopper sides. The sludge pump shall have no valves or moving parts. It shall be similar to a positive displacement sludge ejector. Airlift type pumps for removing sludge from the hopper will not be acceptable. Each sludge pump shall have an air inlet flow regulating ball valve. The discharge line shall have a gate valve to provide back-flow air purge if required. The sludge return from the pump shall be carried to the aeration tank where the circulation of the tank will carry it to mix with influent waste.

SCUM REMOVAL SYSTEM

The floating sludge shall be skimmed from the inlet distribution trough by an airlift surface skimmer at each end of the trough. These 2" surface skimmers shall also be capable of skimming the surface of the clarifier if required. Skimming at the inlet trough shall be required to prevent excessive surface overflow rates because of surface skimming. Each surface skimmer shall have both a regulating air inlet ball valve and a discharge gate valve for backflushing. The level of the surface skimmer shall be adjustable by turning a knob on top of the clarifier. The surface skimmers shall discharge into the sludge pump discharge pipe for a single sludge return to the aeration tank. All air line connections to sludge pumps and skimmers shall be by flexible connection for easy withdrawal.

EFFLUENT WEIR

The clarified liquid shall pass over the edges of the effluent weir in to the effluent trough which shall be connected to the clarifier outlet pipe. The adjustable weir plate shall be 1/8" aluminum plate and shall have 1" deep 90° notches, spaced approximately 4" apart. The scum baffle shall be 1/4" steel plate x 6" deep welded to the tank wall.

A grout box capable of accepting a maximum pipe of 8" diameter shall be provided for the purchaser's outlet pipe.

DESIGN DATA SELECTION TABLE
MODEL V "ADDIGEST" WASTEWATER TREATMENT SYSTEMS
CYLINDRICAL AERATION TANKS

Model No.	DESIGN CHARACTERISTICS			No. of Air Drop-Pipes	LAYOUT & SHIPPING			
	Volume		Typical BOD_5 Capacity Lbs./D(1)(2)		Dimensions - Ft. & Inches			Approx. Shipping Weight Lbs.
	Gallons	Cu. Ft.			Length	Width	Height	
10CA9	9,000	1,200	18	5	17-5 3/4	10-0	9-8 3/8	8,979
10CA10	10,000	1,332	20	6	19-4	10-0	9-8 3/8	9,704
10CA11	11,000	1,465	22	7	21-2 1/2	10-0	9-8 3/8	10,399
10CA12	12,000	1,600	24	7	23-0 3/4	10-0	9-8 3/8	10,946
10CA13	13,000	1,735	26	8	24-11	10-0	9-8 3/8	11,572
10CA14	14,000	1,869	28	8	26-9 1/2	10-0	9-8 3/8	12,069
10CA15	15,000	2,000	30	9	28-7 3/4	10-0	9-8 3/8	12,636
12CA16	16,000	2,130	32	8	24-9 1/2	12-0	9-8 3/8	12,049
12CA17	17,000	2,270	34	8	26-3 3/4	12-0	9-8 3/8	12,517
12CA18	18,000	2,400	36	9	27-9 1/2	12-0	9-8 3/8	12,836
12CA19	19,000	2,538	38	9	29-3 3/4	12-0	9-8 3/8	13,321
12CA20	20,000	2,674	40	10	30-8 3/4	12-0	9-8 3/8	13,776

(1) Based on 15 lbs. of 5-day BOD per 1,000 cu. ft. of aeration capacity. Actual load for a specific installation may vary depending on job conditions and design criteria used by design engineer or set by the regulatory agency.

(2) Refer to Design Notes for recommended air supply. Blowers may be selected on the basis of 3.5 PSI pressure.

(3) All CA tanks to be installed below ground are furnished with two magnesium anode packs.

HOPPER BOTTOM CLARIFIERS

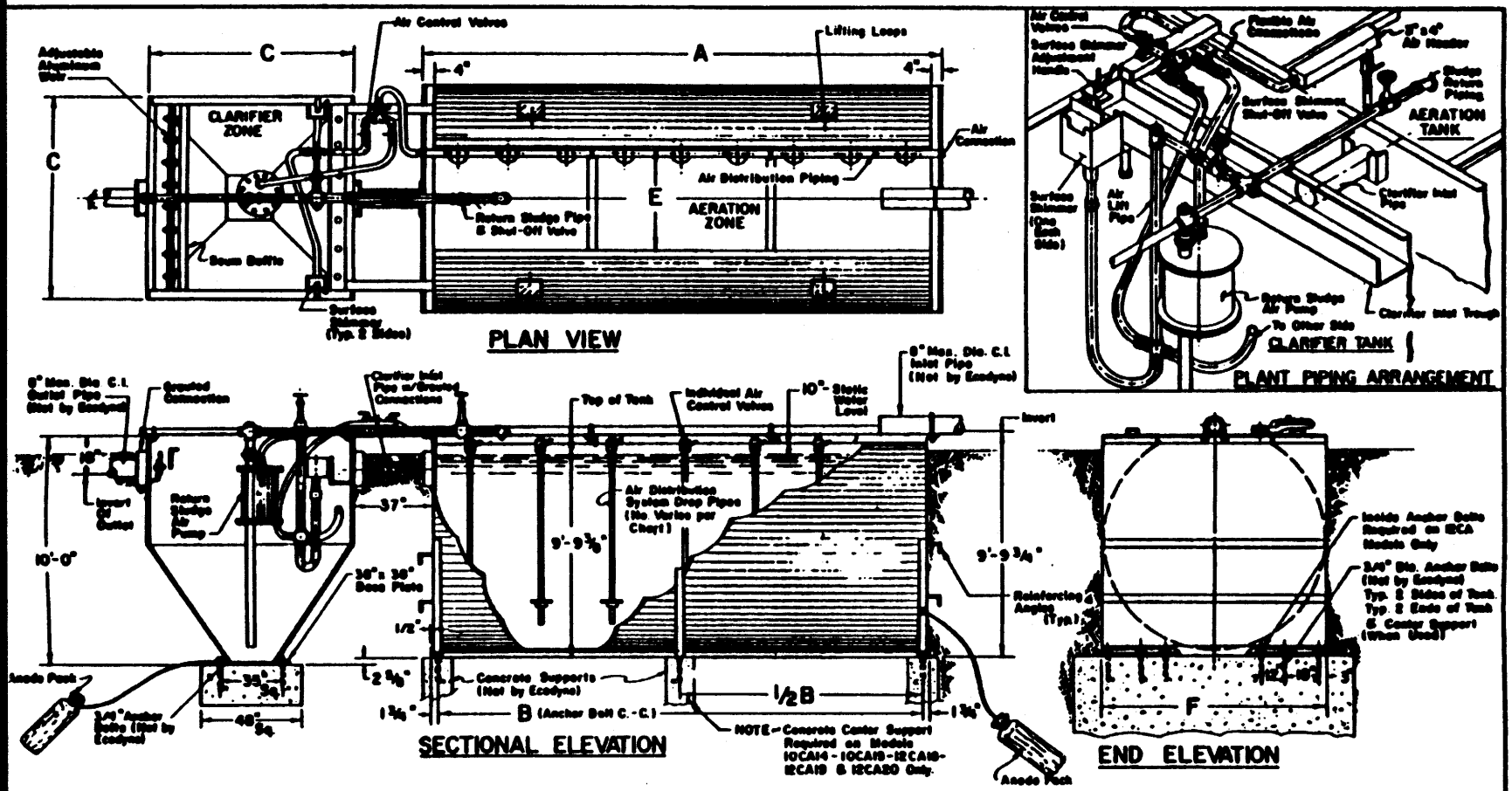
DESIGN DATA SELECTION TABLE

DESIGN CHARACTERISTICS											LAYOUT & SHIPPING		
					Volume - Gals.			Design Flow			Dimension Ft.		
Model No.	No. * of Hoppers	Surface Area Sq. Ft.	Weir Length Ft.-In.	Inlet & Outlet In.	Standard Total Volume	4 Hr. Ret. Total Volume	4 Hr. ** Ret. Volume	4 Hr. Ret. g/ft.^{2}/day	GPD Standard g/ft.^{2}/d/gal.	Approx. Weight Lbs.	Length	Width	Height
10C47	1	47	6'-6"	8	2,620	2,720	2,500	425	250/11,750	3,040	7	7	10
10C78	1	78	8'-6"	8	4,100	4,190	3,840	394	300/23,400	3,643	9	9	10
10C97	1	97	9'-6"	8	4,560	4,670	4,170	345	300/29,100	3,981	10	10	10
10C156	2	156	17'-6"	8	8,200	8,380	7,680	394	350/54,600	5,887	9	18	10
10C194	2	194	19'-6"	8	9,120	9,340	8,340	348	350/67,900	6,665	10	20	10
10C290	3	290	29'-6"	8	13,680	14,010	12,510	344	350/101,500	9,551	10	30	10

* One return sludge airlift pump per hopper.

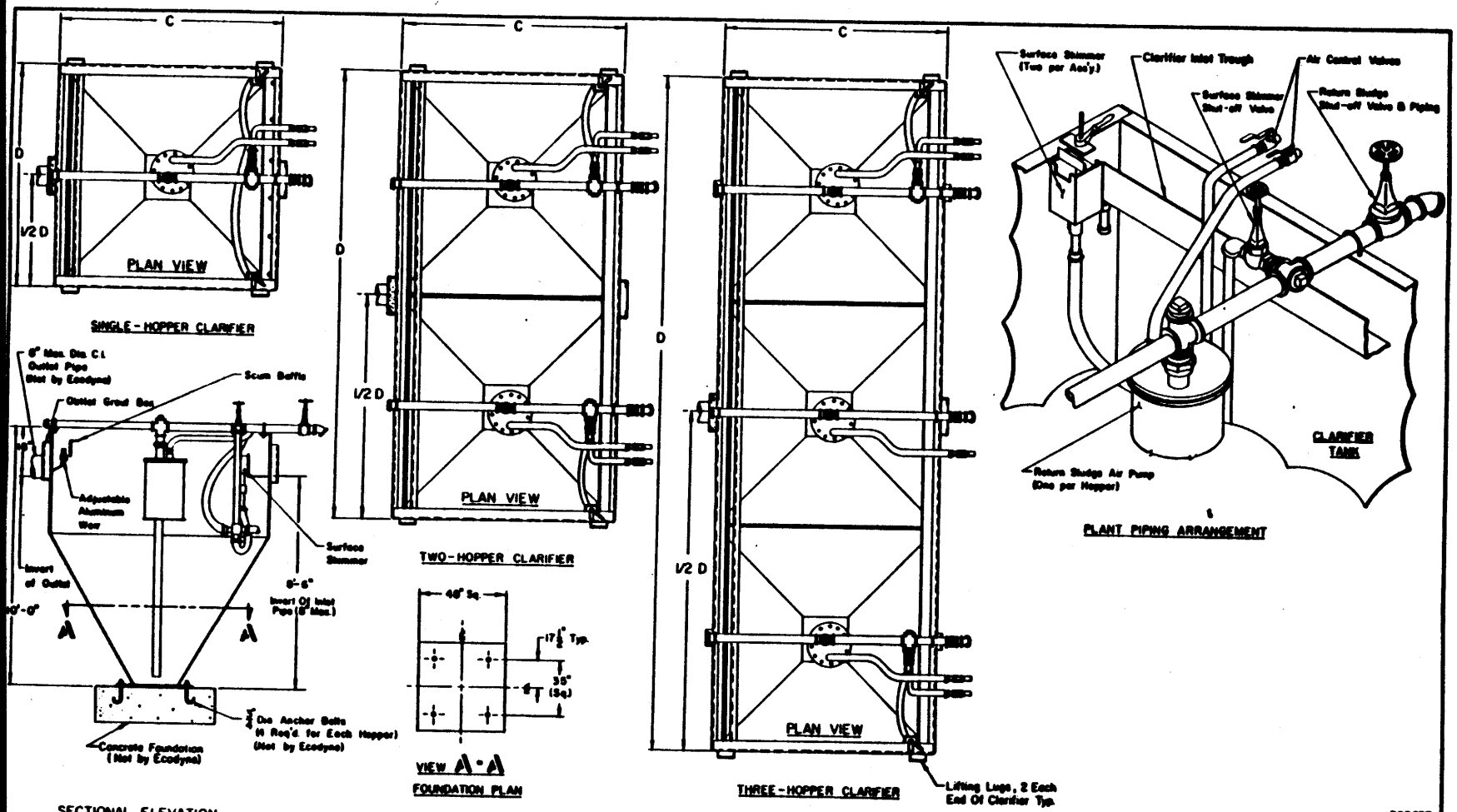
* One magnesium anode pack per hopper is furnished for underground installations.

** Volume includes capacity above sludge hopper(s) plus capacity in upper 1/3 of hopper section.



AERATION TANK DATA												
MODEL	10CA9	10CA10	10CA11	10CA12	10CA13	10CA14	10CA15	12CA16	12CA17	12CA18	12CA19	12CA20
GALLONS	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	17,000	18,000	19,000	20,000
DIM. A	17'-8 1/8"	18'-4"	21'-2 1/4"	23'-0 1/2"	24'-11"	26'-9 1/2"	28'-7 1/8"	24'-8 1/2"	26'-3 3/4"	27'-9 1/2"	29'-3 3/4"	30'-8 1/4"
DIM. B	16'-7 1/4"	17'-3 1/2"	20'-4"	22'-2 1/2"	23'-0 1/2"	25'-11"	27'-9 1/4"	23'-11"	25'-5 1/4"	26'-11"	28'-5 1/4"	29'-10 1/4"
DIM. E	4'-7 1/4"	4'-7 1/4"	4'-7 1/4"	4'-7 1/4"	4'-7 1/4"	4'-7 1/4"	4'-7 1/4"	5'-10 1/2"	5'-10 1/2"	5'-10 1/2"	5'-10 1/2"	5'-10 1/2"
DIM. F	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	10'-0"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"
No. of SUCT. PIPES	8	8	7	7	8	8	9	8	8	9	9	10

CLARIFIER DATA	
CLARIFIER MODEL	10C97
AERATION TANK MODEL USED	10CA14
Surface Area - FT²	97
DIM. C	10



CLARIFIER DATA						
MODEL	10C47	10C78	10C97	10C156	10C194	10C290
Surface Area - Ft²	47	78	97	156	194	290
DIM C	7'-0"	9'-0"	10'-0"	9'-0"	10'-0"	10'-0"
DIM D	7'-0"	9'-0"	10'-0"	18'-0"	20'-0"	30'-0"
No of Hoppers	1	1	1	2	2	3

300657

ECODYNE

WASTEWATER TREATMENT
CLARIFIER
1,2 & 3 - HOPPER MODELS

300657

ENGINEERING DATA

Smith & Loveless
14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215

DR Filters
64-400.1
April, 1978

SPECIFICATIONS FOR DESIGN RATE TERTIARY FILTER SIMPLEX UNITS

GENERAL

There shall be furnished and installed, as shown on the plans, 1 Design Rate Filter(s), as manufactured by Smith & Loveless Division, Ecodyne Corporation.

The filtration unit shall be furnished as a factory-built welded steel assembly. The unit shall be a self-contained system composed of a filter cell, a machinery area, and a backwash water storage tank (which shall also be designed for use as a chlorine contact tank). The unit shall be constructed for installation ~~above~~ (below) grade.

DESIGN CONDITIONS

Effluent from the secondary treatment plant shall be filtered at a design rate not to exceed 5 GPM per square foot of filter area, based on the maximum discharge rate of the secondary treatment plant. The filtration unit shall be capable of automatic initiation of backwash cycle when the pressure drop across the filter bed exceeds 3' of water. The cleaning cycle shall consist of an upflow air scour period, followed immediately by a water backwash period.

The duration of the upflow air scour period shall be 5 minutes, at an air flow rate of from 3 to 5 CFM per square foot of filter area. The water backwash period shall last 5 minutes, during which time filtrate from the backwash water storage tank shall be pumped through the filter bed at a flow rate of 15 GPM per square foot of filter area. The backwash water shall discharge from the filter cell through an overflow trough.

Simplex filtration units shall be furnished with an automated influent control valve to "lock out" flow from the secondary treatment plant during the filter bed cleaning cycle.

MACHINERY AREA

The machinery area shall contain one backwash pump, one air scour blower and all necessary automatic controls. For below-grade installation the machinery area shall be enclosed on all sides with reinforced ASTM A-36 1/4" thick steel plate. All equipment shall be located as shown on the drawings.

PUMP

The pump shall be close-coupled and especially designed for the use of a mechanical seal. The pump shall be of heavy, cast iron construction. A motor shall be attached to the pump volute by a one-piece cast iron adaptor-backhead.

The pump shaft shall be sealed against leakage by a mechanical seal. The seal shall be of carbon and ceramic construction with the mating surfaces lapped to a flatness of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring. The seal shall

The pump impeller shall be enclosed, cast iron and balanced. The impeller shall be keyed and secured to the motor pump shaft with a stainless steel cap screw. The motor shaft shall have a taper fit to the impeller.

BACKWASH PUMP MOTOR

The pump motor shall be a 2 HP, 875 RPM weather protected type suitable for operation on 3 phase, 60 Hertz, _____ volt current and shall have NEMA Design B characteristics.

CONTROLS

The filter operation shall be automatically controlled with provision for manual backwash. The control equipment shall be mounted within a NEMA Type IV enclosure.

Thermal magnetic air circuit breakers shall be provided for branch disconnect service and over-current protection of all motor, control and auxiliary circuits. Magnetic across-the-line starter with under-voltage release and overload coils for each phase shall be provided for the backwash pump. All switches shall be labeled and a coded wiring diagram shall be provided.

When the water level in the filter chamber reaches a predetermined level, the filter inlet valve shall close. Following a drain-down period, the filter bed shall be air scoured for five minutes. After the air scour, the filter bed shall be backwashed for five minutes. The air scour and backwash periods shall be timer controlled.

Following the backwash period, the filter inlet shall open, allowing the filter to resume normal service.

AIR SCOUR BLOWER

There shall be furnished one centrifugal blower, with a direct-coupled motor drive to deliver 45 CFM of free air at 5.0 PSI discharge pressure. The blower shall be equipped with the suction throttling valve and combination inlet filter-silencer. A check valve shall be installed on the discharge line to protect the blower from possible system backflow contamination. The blower shall be driven by a single mesh spur gear speed increaser. A weather protected _____ HP, 3600 RPM, NEMA "D" flange electrical motor with NEMA type "B" insulation shall be bolted to the speed increaser. The motor shall be suitable for 230/460 volts, 3 phase, 60 cycle current.

VALVES

An electrically actuated butterfly valve shall be provided at the inlet of the filtration unit to automatically "lock out" flow during the backwash cycle. The butterfly valve shall have a working pressure of 150 PSI and shall have a seat and seals

ENGINEERING DATA

Smith & Loveless
14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215

a shaft of stainless steel. The valve shall be mounted between ASA 150-lb. flanges. The design of the valve shall also provide for manual operation.

SUMP PUMP (BELOW-GRADE UNITS ONLY)

There shall be furnished with each unit designed for installation below grade, a submersible pump with close-coupled vertical motor. The pump shall be capable of pumping 40 GPM against a head of 10 feet. The pump shall be controlled automatically by a self-contained float switch capable of operation on a 5" differential. The pump shall be installed in a sump well which shall be properly screened to prevent the entry of debris.

FILTER CELL

The filter cell shall have a total surface area of 15 square feet. The filter media shall consist of a 12" deep layer of anthracite coal and a 12" deep layer of sand. The anthracite shall have an effective size of 2.0 mm and a uniformity coefficient of 1.75. The sand shall have an effective size of 0.9 mm and a uniformity coefficient of 1.3 to 1.5.

All media shall be shipped in 100-pound bags. Media shall be delivered to the job site by truck.

The underdrain system shall be especially designed for air scour. The strainer design and placement shall be such that a scrubbing action is imparted to the water and media during air scour and backwash. The strainers shall be fabricated of ABS plastic. Access to the underdrain shall be provided by a removable section of the strainer plate on below-grade units and by an external manway on above-grade units.

The filter cell area shall be constructed of reinforced ASTM A-36 1/4" thick steel plate.

BACKWASH WATER STORAGE/CHLORINE CONTACT TANK

The backwash water storage tank shall be constructed of reinforced ASTM A-36 1/4" steel plate. The storage tank volume shall contain a minimum of 75 gallons per square foot of filter area. When used as a chlorine contact tank, the storage tank shall contain two flow-directing baffles constructed of reinforced ASTM A-36 1/4" thick steel plate.

TANK DRAINS

Two-inch threaded drain couplings shall be provided, as shown on the drawings, in the backwash storage tank and the filter underdrain compartment. On the below-grade units, a two-inch threaded drain coupling shall be provided in the machinery area.

PROTECTION AGAINST CORROSION

After welding, all inside and outside surfaces of the structure shall have a near-white blast cleaning. All weld spatter and surface roughness shall be removed by grinding. Immediately following cleaning, a "Versapox" epoxy resin coating shall be applied to all surfaces. The dry coating shall contain a minimum of 85% epoxy resin with the balance being pigments, scratches occurring during installation. This kit shall contain detailed instructions for use.

On below-ground installations, 17-pound magnesium anode paks shall be provided for cathodic protection. The anode paks shall be provided with a minimum of 15 feet of insulated copper leads. Copper lugs shall be provided for anode connections.

PIPING

Piping shall be Schedule 40 steel pipe. All pipe shall be coated with "Versapox" epoxy resin coating.

WIRING

The machinery area shall be completely wired at the factory, except for the power feeder lines. All wiring shall be coded as indicated on the wiring diagram. All wiring shall conform to the National Electrical Code.

FACTORY TESTS

The completed filter shall be given an operational test to check for vibration, leaks and for operation of automatic controls. The unit shall be coupled to a reservoir and the pump shall recirculate water for simulated service conditions. Automatic controls shall be adjusted to start and stop the pump at set levels.

INSTALLATION AND OPERATING INSTRUCTIONS

Written instructions shall be provided for installation of the filter and related appurtenances. Operating manuals shall be furnished to cover the operation, maintenance and servicing procedures of the individual components.

The services of a factory representative shall be provided to perform the following functions:

1. Check filter strainers.
2. Supervise installation of media by purchaser.
3. Supervise washing and scraping of media.
4. Direct initial start-up.
5. Instruct operating personnel in operation and maintenance of equipment.

GUARANTEE

The filter structure and equipment is guaranteed to be free from defects in design, material and workmanship. The guarantee shall be for one year from date of start-up, but no more than 18 months from date of shipment.

NOT FURNISHED BY SMITH & LOVELESS (AS STANDARD)

1. Freezing and special environment protection of the filter.
2. Wiring external to filter control panel.
3. Labor for installation of parts.
4. Delivery from railhead to job site when equipment, because of size, must be shipped by rail.
5. Labor for unloading and installation of media.

ENGINEERING DATA

Smith & Loveless

14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215

DR Filters
64-300.1
April, 1978

MODEL DR TERTIARY FILTER
DESIGN DATA

MODEL NO.	APPROXIMATE WEIGHT OF UNITS (IN POUNDS)			
	ABOVE GRADE		BELOW GRADE	
	SHIPPING	OPERATING	SHIPPING	OPERATING
Simplex				
DR-10	5,800	19,700	6,800	20,800
DR-15	7,400	29,900	8,900	31,400
DR-20	8,800	38,900	10,700	40,800
DR-25	9,900	47,500	12,400	50,000
DR-30	11,000	58,400	14,000	62,000
DR-40	13,500	76,700	16,300	79,500
DR-50	14,650	100,000	18,600	104,000
Duplex				
DDR-10	6,500	30,700	7,800	32,000
DDR-15	7,700	43,500	9,300	45,200
DDR-20	10,000	57,200	11,800	59,000
DDR-25	11,700	71,100	13,400	72,800
DDR-30	12,900	82,600	15,500	85,200
DDR-40	14,500	106,900	17,800	110,200
DDR-50	18,800	134,300	22,400	137,900

MODEL DR TERTIARY FILTER
DESIGN DATA

MODEL NO.	FILTER						FILTRATION MEDIA			
							SAND		ANTHRACITE	
	NOMINAL MEDIA SURFACE (SQ. FT.)	MAX. FLOW RATE (GPM)	INLET PIPE DIA. (IN.)	OUTLET PIPE DIA. (IN.)	B.W. OUTLET PIPE DIA. (IN.)	AVAILABLE B.W. VOLUME (GAL.)	VOLUME (CU. FT.)	WEIGHT (TONS)	VOLUME (CU. FT.)	WEIGHT (TONS)
Simplex										
DR-10	10	50	4	4	6	788	10	0.55	10	0.28
DR-15	15	75	4	4	8	1,346	15	0.82	15	0.45
DR-20	20	100	6	6	8	1,795	20	1.1	20	0.56
DR-25	25	125	6	6	8	2,244	25	1.4	25	0.70
DR-30	30	150	6	6	10	2,827	32	1.7	32	0.90
DR-40	40	200	8	8	10	3,770	42	2.3	42	1.20
DR-50	50	250	8	10	12	6,170	50	2.8	50	1.40
Duplex										
DDR-10	20	70	4	4	6	975	20	1.1	20	0.57
DDR-15	30	105	6	6	8	1,436	30	1.7	30	0.83
DDR-20	40	140	6	6	8	1,885	40	2.2	40	1.20
DDR-25	50	175	6	8	8	2,424	50	2.8	50	1.40
DDR-30	60	210	8	8	10	2,792	60	3.4	60	1.70
DDR-40	80	280	8	12	10	3,665	80	4.5	80	2.3
DDR-50	100	350	8	14	12	4,572	100	5.5	100	2.8

Notes:
1. For Simplex units, max. flow rate base on 5 GPM/SF; Duplex units 3.5 GPM/SF.
2. Backwash rates are designed for 15 GPM/SF for both styles.

ENGINEERING DATA

Smith & Loveless
14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215

DR Filters
64-300.3
April, 1978

DR Filters
04-300.2
June, 1993

ENGINEERING DATA

Smith & Loveless, Inc.

14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215

MODEL DR TERTIARY FILTER
DESIGN DATA

	WATER BACKWASH						AIR SCOUR		
MODEL	PUMP MODEL	MOTOR HP	RPM	B/W FLOW GPM	SUCTION PIPE DIA. IN.	DISCHARGE PIPE DIA. IN.	BLOWER MOTOR HP	BLOWER MIN. CFM	CAPACITY MAX. CFM
Simplex									
DR-10	4B2D	2	875	150	4	4	5	30	80
DR-15	4B2D	2	875	225	4	4	5	45	90
DR-20	4B2D	2	875	300	4	4	5	60	100
DR-25	4B2D	2	875	375	4	4	5	75	125
DR-30	4B2D	3	1170	450	6	6	5	90	150
DR-40	4B2D	5	1170	600	6	8	5	120	200
DR-50	6B3B	5	875	750	6	8	7.5	150	250
Duplex									
DDR-10	4B2D	2	875	150	4	4	5	30	80
DDR-15	4B2D	2	875	225	4	4	5	45	90
DDR-20	4B2D	2	875	300	4	4	5	60	100
DDR-25	4B2D	2	875	375	4	4	5	75	125
DDR-30	4B2D	3	1170	450	6	6	5	90	150
DDR-40	4B2D	5	1170	600	6	8	5	120	200
DDR-50	6B3B	5	875	750	6	8	7.5	150	250

Notes: 1. Water backwash rates are designed for 15 GPM/SF for both styles.

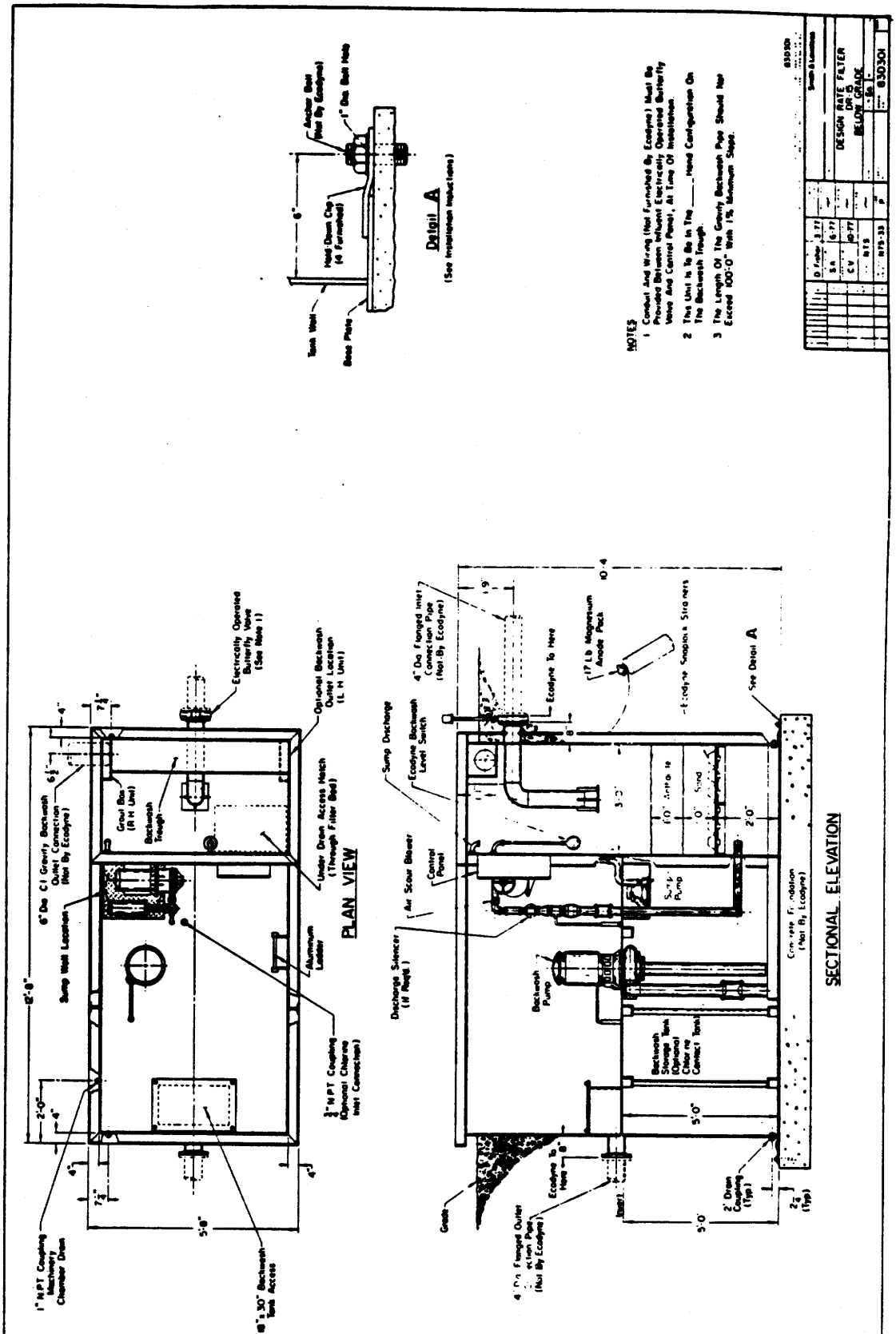
2. Blower for air scour is (3600 RPM) centrifugal unit utilizing 2" diameter piping.

DR Filters
64-500.4
April, 1978

ENGINEERING DATA

Smith & Loveless

14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215



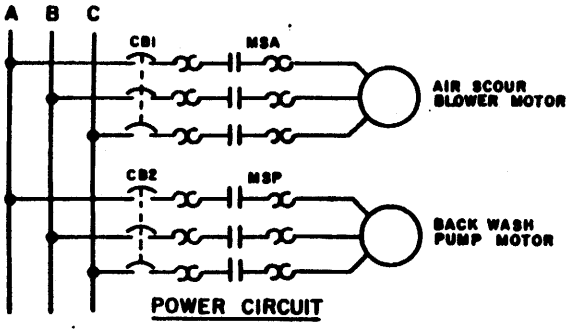
DR Filters
64-500.6
April, 1978

ENGINEERING DATA

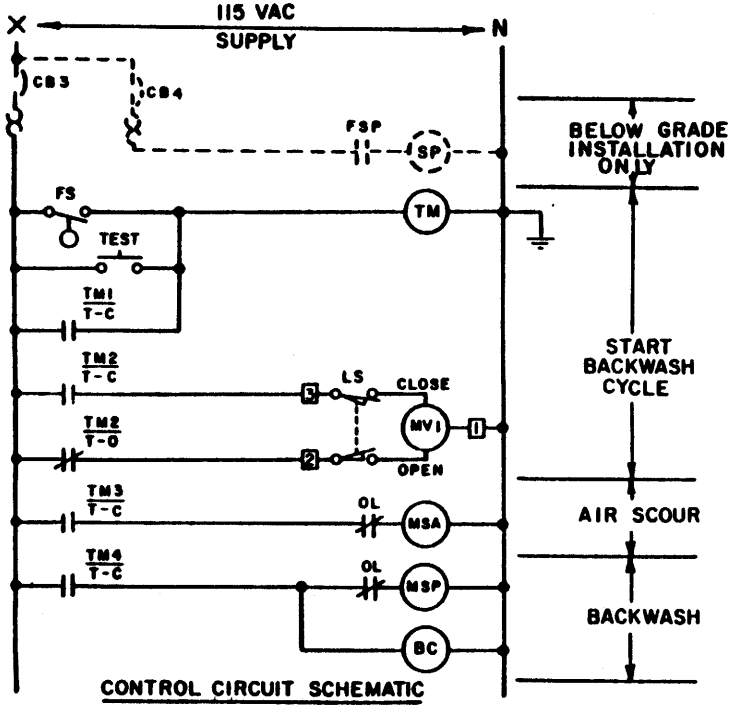
Smith & Loveless

14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215

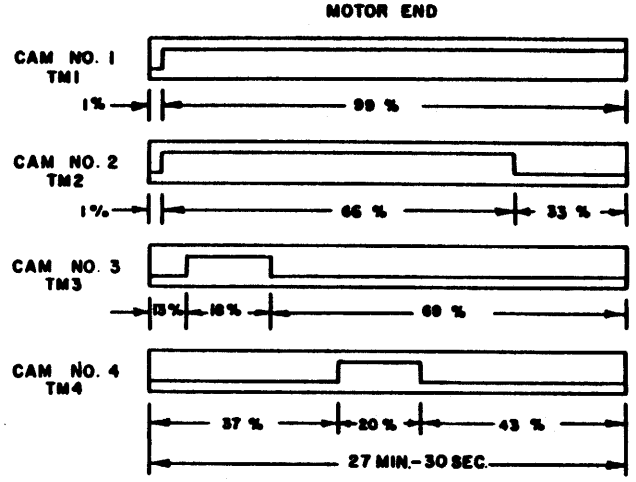
230/460 VOLT-3-PHASE-60 HERTZ



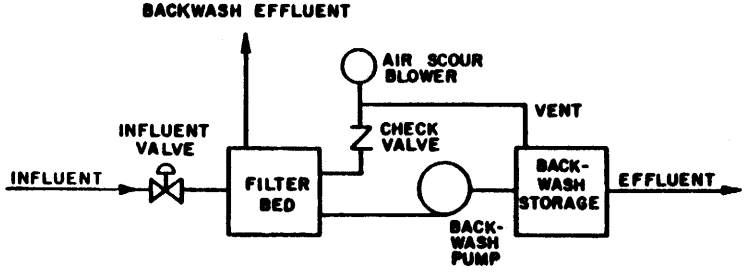
POWER CIRCUIT



CONTROL CIRCUIT SCHEMATIC



TIMER PROGRAM



FLOW DIAGRAM

LEGEND

BC – BACKWASH CYCLE COUNTER
CB – CIRCUIT BREAKER
FS – FLOAT SWITCH
FSP – FLOAT SWITCH – SUMP PUMP
MSA – MOTOR STARTER (AIR SCOUR)
MSP – MOTOR STARTER (BACKWASH PUMP)
LS – LIMIT SWITCH
MVI – MOTOR OPERATED VALVE (INFLUENT)
OL – OVERLOAD RELAY
SP – SUMP PUMP
TM – TIMER
– TC – TIMED CLOSED CONTACT
– TO – TIMED OPEN CONTACT

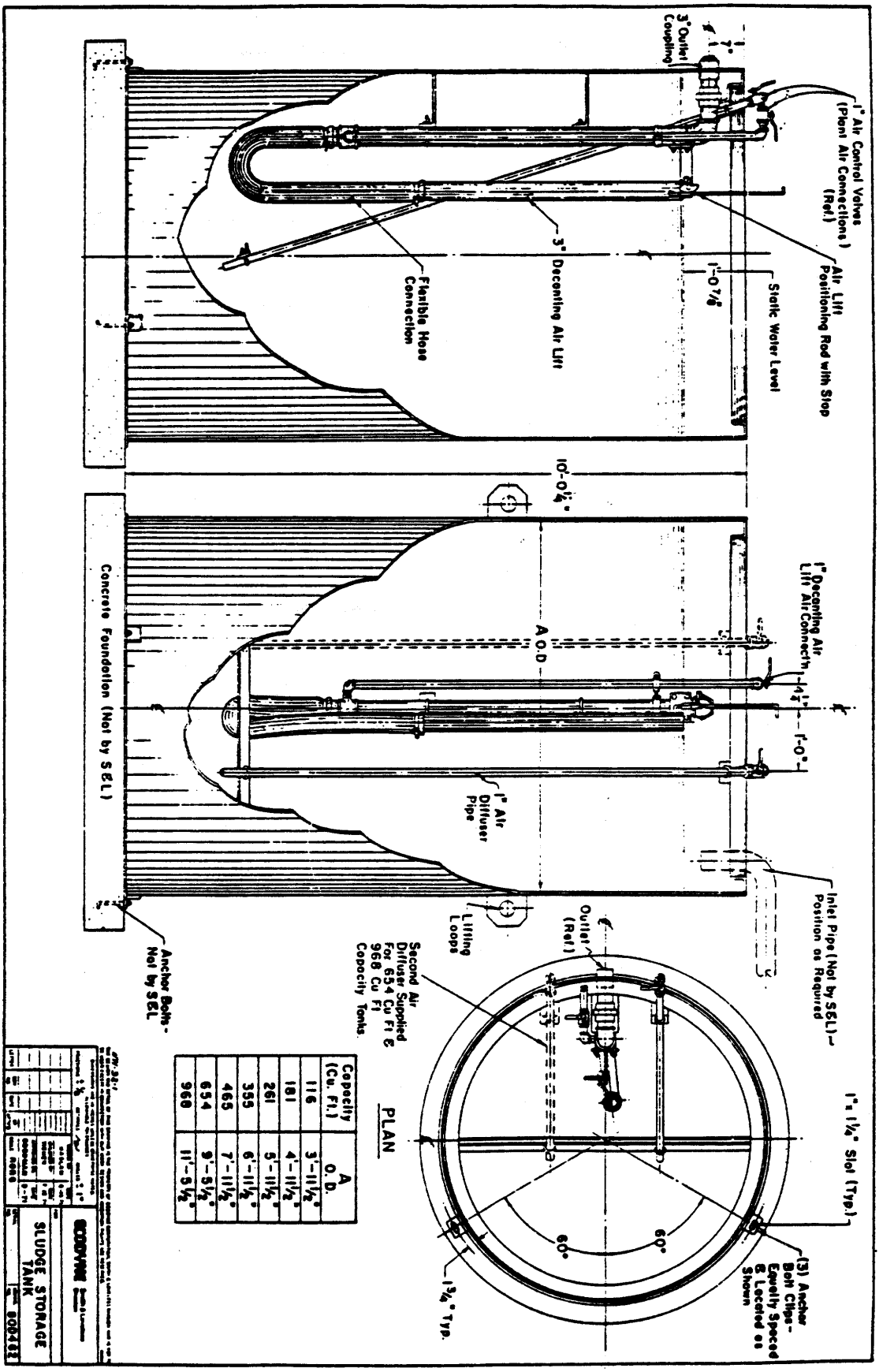
83C263

DRAWN BY	D. Fisher	DATE	6-77
CHECKED BY	H.E.W.	DATE	8-77
APPROVED BY	C.V.	DATE	10-77
ISSUED	None		
ORIGINAL ISSUE	N75-33	CODE	P

Smith & Loveless

DESIGN RATE FILTER
FLOW & CONTROL DIAGRAM

83C263

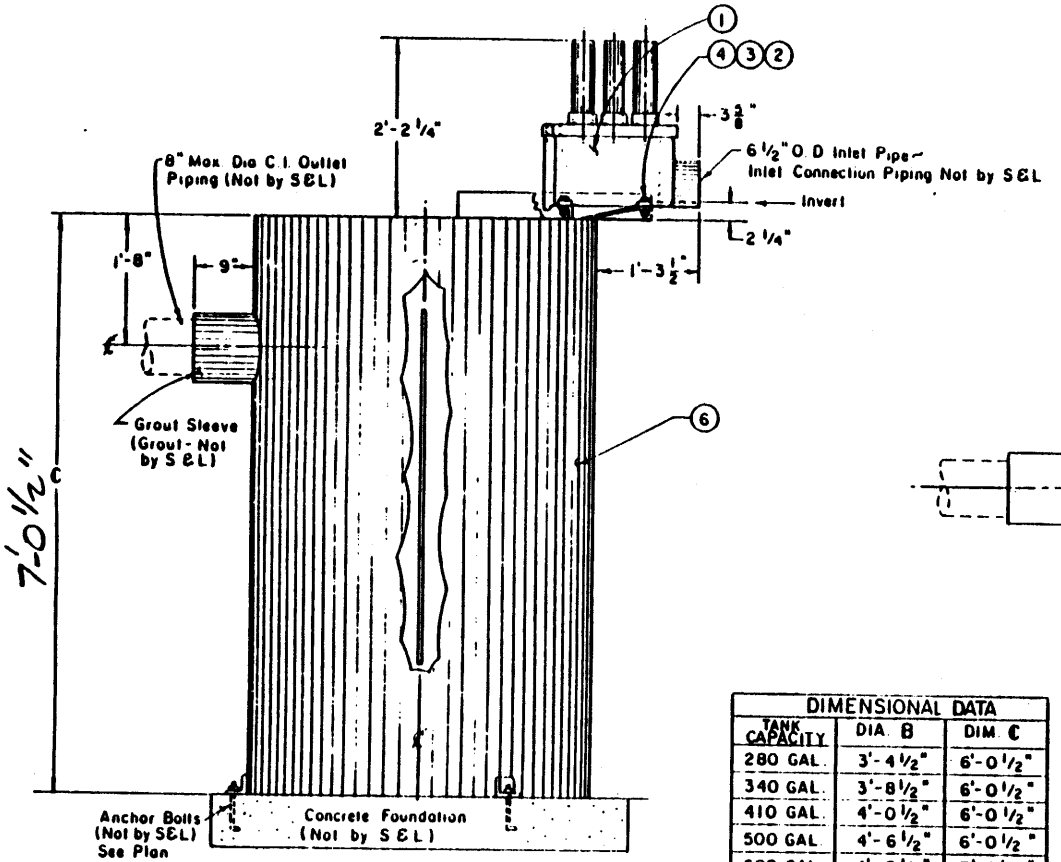


Capacity (Cu. Ft.)	A O.D.
116	3'-11 1/2"
181	4'-11 1/2"
261	5'-11 1/2"
355	6'-11 1/2"
465	7'-11 1/2"
654	9'-5 1/2"
968	11'-5 1/2"

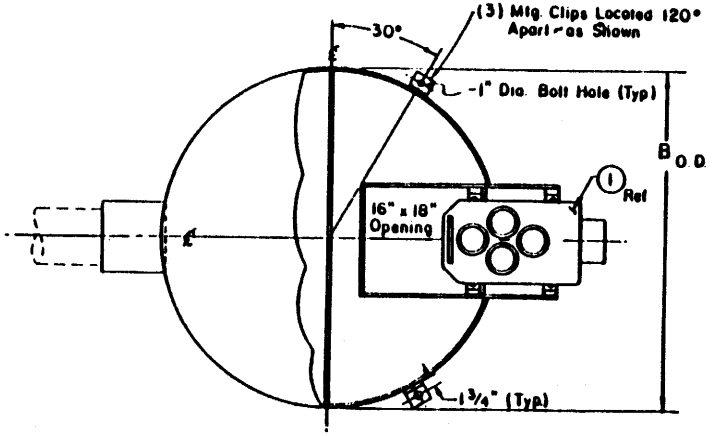
ECODYNE

SLUDGE STORAGE TANK

BOOKLET



ELEVATION



PLAN VIEW

PARTS LIST			
ITEM	S&L No	QTY.	DESCRIPTION
1	3L37	1	"SANURIL" CHLORINATOR - MODEL 1000 - Complete with Three Wier Plates - 1" Wide Slot - 2" Wide Slot & 3" Wide Slot.
2	6L59AF	4	CAP SREW - 1/4-20 x 1-3/4" Lg - S.S.
3	6L94E	4	LOCK WASHER - 1/4 - S.S.
4	6L30C	4	HEX NUT - 1/4-20 - S.S.
5	3L38	1	45 Lb Pail - "SANURIL 115" TABLETS
6	54D2044	1	CHLORINE CONTACT TANK

NOTE - Chlorinator Tank to Be Shipped with Chlorinator Unmounted.. Mounts in Field with Hardware Provided by S&L.

DIMENSIONAL DATA		
TANK CAPACITY	DIA. B	DIM. C
280 GAL.	3'-4 1/2"	6'-0 1/2"
340 GAL.	3'-8 1/2"	6'-0 1/2"
410 GAL.	4'-0 1/2"	6'-0 1/2"
500 GAL.	4'-6 1/2"	6'-0 1/2"
600 GAL.	4'-5 1/2"	7'-0 1/2"
700 GAL.	4'-9 1/2"	7'-0 1/2"
800 GAL.	5'-1 1/2"	7'-0 1/2"
900 GAL.	5'-4 1/2"	7'-0 1/2"
1000 GAL.	5'-8 1/2"	7'-0 1/2"

NTS-1

CHLORINE CONTACT TANK - 280 THRU 1000 GAL. CAP. WITH "SANURIL" CHLORINATOR
54D2046